

SECTION 8
LUBRICATION

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JELLIFF FILLER BREATHER.	450
CRANE DEMING HAND PUMP	1570-0
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PARTS LIST MAIN OIL PUMP	90412-A
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DYNAPURE COLLECTOR	SCPC-290

SECTION 8

LUBRICATION

A single lubrication system is used for the entire set, including the generator and hydraulically operated governor controls.

The main oil sump is an integral part of the sub-base structure. It contains baffles to allow for pitch and roll in shipboard service. It is equipped with inspection and clean out ports, an oil filter and breather assembly. A gauge board is conveniently mounted above the sump at the front end of the set. Please refer to the outline drawings (Section 3) for more details.

The main components in the system i.e., pumps, cooler and strainer are mounted on the sub-base. The other components such as sight flow indicators, thermometers, orifices, valves and pressure switches, etc., are all located in the piping system. Please refer to the oil piping diagram for a more detailed listing.

The main oil pump is a positive displacement, gear type, vertically supported from the side of the gear case projecting into the oil sump to ensure flooding. It is driven from the free end of the low speed shaft through a right angle gear and vertical extension shaft. An auxiliary motor driven pump is also supplied. This is also a vertical set with the pump portion suspended into the oil pump to ensure flooding. An oscillating hand pump for priming or starting without power is also provided. This pump takes its suction directly from the sump and feeds into the main pump discharge line after the check valve.

Protective devices are incorporated into the lubrication system as follows:

- A. Low oil pressure shutdown device in the Woodward governor, see Woodward bulletins.
- B. Low oil pressure alarm switch.
- C. Low oil pressure trip mechanism in the T & T valve.
- D. Overspeed trip dump valve operating with the low oil pressure trip mechanism in the T & T valve.

Please refer to separate instructions on the alarm switches, speed governor and the trip and throttle valve for more details on the operation of these devices.

GENERAL INFORMATION

Keep the oil system clean and free from water. It is suggested that a small quantity of oil be drained periodically from the bottom of the reservoir and especially after prolonged shutdown periods, during which sediment and water will have a chance to settle to the bottom.

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Oil leaks are unsightly, and in proximity to parts carrying hot steam, constitute a fire hazard. All such leaks should be corrected immediately.

NOTE: When lubrication of turbine bearings and reduction gear is from the same common source, oil should be selected to suit the reduction gear.

FLUSHING PROCEDURE

1. Remove turbine bearing caps.
2. Make sure that lower half rotor support rings are in position; remove journal bearings and thrust pads.
3. Store bearings carefully to avoid damage.
4. Replace bearing caps and bolt tightly. Fit triple layer of cheesecloth in filters. Fill oil reservoir with flushing oil; check that lube system is in correct operating mode.
5. Start lube pump, keeping careful check on oil level as system fills.
6. Check that oil is flowing at all points in system, venting as necessary to ensure flow. Check operation of pressure gauges and observe sight flows.
7. Check for any leakage, if any, repair immediately.
8. Raise oil temperature to 160° F (71° C).
9. Circulate flushing oil for a minimum of 6 hours, longer if cheesecloth does not remain clean.
10. During flushing, operate switch over valves and by-passes to ensure that all parts of the system are thoroughly flushed. Slight oil spray to gears when fitted.
11. On completion, drain system completely and remove cheesecloth.
12. Thoroughly clean and wipe out oil reservoir; check that all strainers are clean.
13. Remove turbine bearing caps. Refit bearings after thorough cleaning. Lubricate liberally with turbine oil during assembly.
14. Remove rotor support rings and store in a safe place for future use.
15. Replace bearing caps and tighten to full torque.

continued..

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16. Refill oil supply with correct grade of lubricating oil. Insure system is completely full. Check oil level filling mark on gauge glass. Oil level must not be allowed to drop below this level.

MAINTENANCE RECOMMENDED

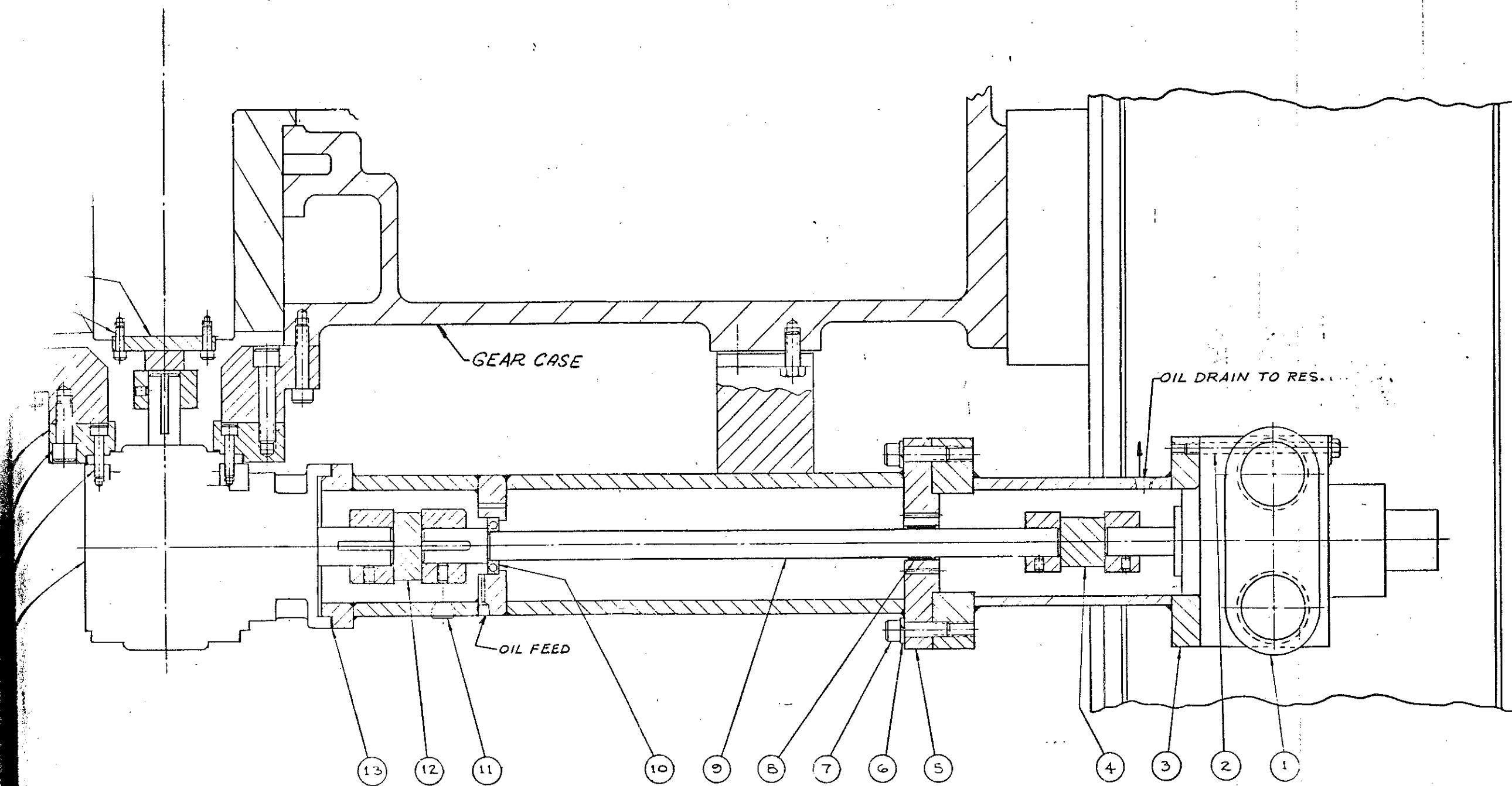
Oil samples should be drawn from oil systems at intervals of not more than 30 days and submitted to analysis. Based upon results of such analysis, the oil charge may be purified or renewed as indicated by comparison with the manufacturers specifications.

In those systems which are not subject to periodic sampling, the lubricant charge shall be renewed at intervals not to exceed 2500 operating hours or six (6) months, the first occurring.

Visual checks of oil color/clarity should be conducted at each check of lubricant level (weekly).

Any change in color or clarity is cause for further investigation or renewal of the lubricant charge.

Excessive debris or filtrates noted during strainer/filter maintenance, while not indicative of oil quality per se, require a thorough check of the lube system to determine the cause.



FOR PARTS LIST SEE 90412A

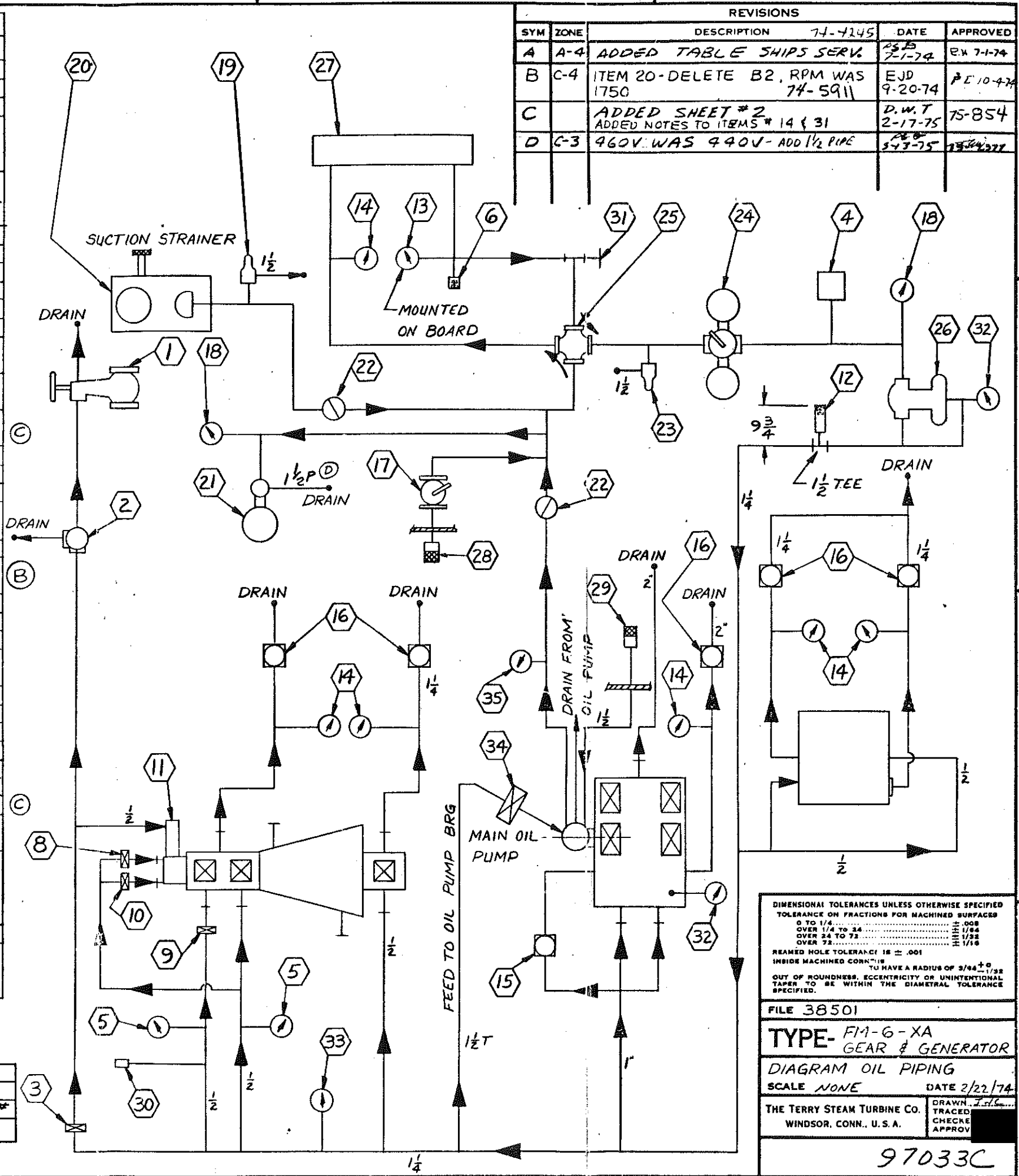
⑥ 38875 A&B	4647/8	1560-1002-1501-U-4647 REQ* 23-470053
⑥ 38269 D/E	4645/46	1560-1023-1507-T-4645 REQ* 22.450053A
38269 A-C	4642/43/44	1560-301-1506-T-4642 REQ* 22.420053A
37906 D/E	4645/46	1560-1023-1506-T-4645 REQ* 22.450053
37906 A-C	4642/43/44	1560-1107-1500-S-4642 REQ* 22.420053
38501 C&D	669	J-44748-B
38501 A&B	668	J-44748-2
38337 A&B	670	J-41934-2
38310 A&B	667	J-41161-2
38155 A&B	666	J-370552
TERRY FILE #	HULL NUMBERS	CUSTOMER'S PURCHASE ORDER #
SHIPS SERVICE TURBINE GENERATOR FOR		

PARTS LIST		
ITEM NO.	NO. REQD.	DESCRIPTION
1	1	T&T VALVE OIL CYLINDER - TO TRIP ON LOSS OF PRESS.
2	1	OIL DUMP VALVE - MANUAL OR OVERSPEED TRIP
3	1	1/8 DIA ORIFICE
4	1	AUX. OIL PUMP PRESS. SWITCH SQ. "D" 9012 - ACR-25 FOR 115 VOLTS - 1 PHASE - 60 CYCLES, CLOSE AT 34 PSI, OPEN AT 43 P.S.I.
5	2	ASHCROFT DURAGAUGE # 1279 B - 4 1/2" DIAL WITH 1278 FLUSH MOUNTING RING, 1/4 BACK CONNECTION. RANGE 0-30* (MOUNTED ON GAUGE BOARD)
6	1	1" N.P.T. "T" CONNECTION FOR CUSTOMERS RTD
8	1	ORIFICE - BY TERRY - SIZE 3/32
9	1	ORIFICE - BY TERRY - SIZE 5/16
10	1	ORIFICE - BY TERRY - SIZE #51 DRILL
11	1	WOODWARD GOVERNOR - TYPE UG-40
12	1	1" N.P.T. FOR CUSTOMERS RTD SENSOR CONNECTION
13	1	ASHCROFT DIAL THERMOMETERS #6435 - 4 1/2" DIAL WITH 1278 FLUSH MOUNT RING - RANGE 0°-250° F
14	6	ASHCROFT DIAL THERMOMETERS #30-6260 AHT 3" DIAL - RANGE 0°-250° F - SEE SHEET #2
15	1	JACOBY TARBOX SIGHT FLOW INDICATOR STYLE 300-S
16	5	JACOBY TARBOX SIGHT FLOW INDICATOR STYLE 100-S
17	1	DEI'ING HAND OIL PUMP FIG. 1570 "O" ALL BRONZE
18	2	ASHCROFT DURAGAUGE #1279 B - 4 1/2" DIAL - 1/4 BOTTOM CONNECTION RANGE 0-100 LBS. (MOUNTED ON BOARD)
19	1	FULFLO RELIEF VALVE #VB-7 SETTING 35-40 P.S.I.
20	1	AUX. OIL PUMP - 3 H.P. - 1150 R.P.M. - 460 VOLTS 60 CYCLES - 3 PHASE, TO HANDLE 40 G.P.M. OF 350 SSU
21	1	OIL RELAY BY TERRY CO.
22	2	CHECK VALVE BY TERRY CO.
23	1	FULFLO RELIEF VALVE #VB-7, SETTING 40 P.S.I.
24	1	KRAISSL CLASS 72-40 F, 2"-150 # MSS FLANGED DUPLEX STRAINER
25	1	KRAISSL 4 WAY VALVE - 2"-125 # FLANGED PORTS
26	1	FISHER REDUCING VALVE - 655A - SETTING 15-20 PSI
27	1	OIL COOLER
28	1	FOOT VALVE (STRAINER & CHECK VALVE)
29	1	SUCTION STRAINER
30	1	3/4 PT. TEE FOR CUSTOMERS L.O. PRESS. SWITCH
31	1	2 1/2" FLANGE FOR CUST. TEMP. CONTROL-SEE SHEET #2
32	2	ASHCROFT DURAGAUGE # 1279 A - 4 1/2" DIAL - 1/4 BOTTOM CONNECTION. RANGE 0-30 LBS.
33	1	ASHCROFT DURAGAUGE # 1279 B - 4 1/2" DIAL WITH 1278 FLUSH MOUNTING RING, 1/4 BACK CONNECTION. RANGE 0-60* (MOUNTED ON GAUGE BOARD)
34	1	ORIFICE - BY TERRY - SIZE 1/16
35	1	ASHCROFT DURAGAUGE # 1279 B - 4 1/2" DIAL WITH 1278 FLUSH MOUNTING RING, 1/4 BACK CONNECTION. RANGE 0-100* (MOUNTED ON BOARD)

THIS DWG IS DIAGRAMMATIC ONLY FOR OUTLINE SEE DWG # 97032E SHTS 1 & 2

38501 C&D	669	J-44748-B
38501 A&B	668	J-44748-2
TERRY FILE #	SUN SHIP HULL #	PURCHASE ORDER #
SHIPS SERVICES TURBINE GENERATOR EQP		

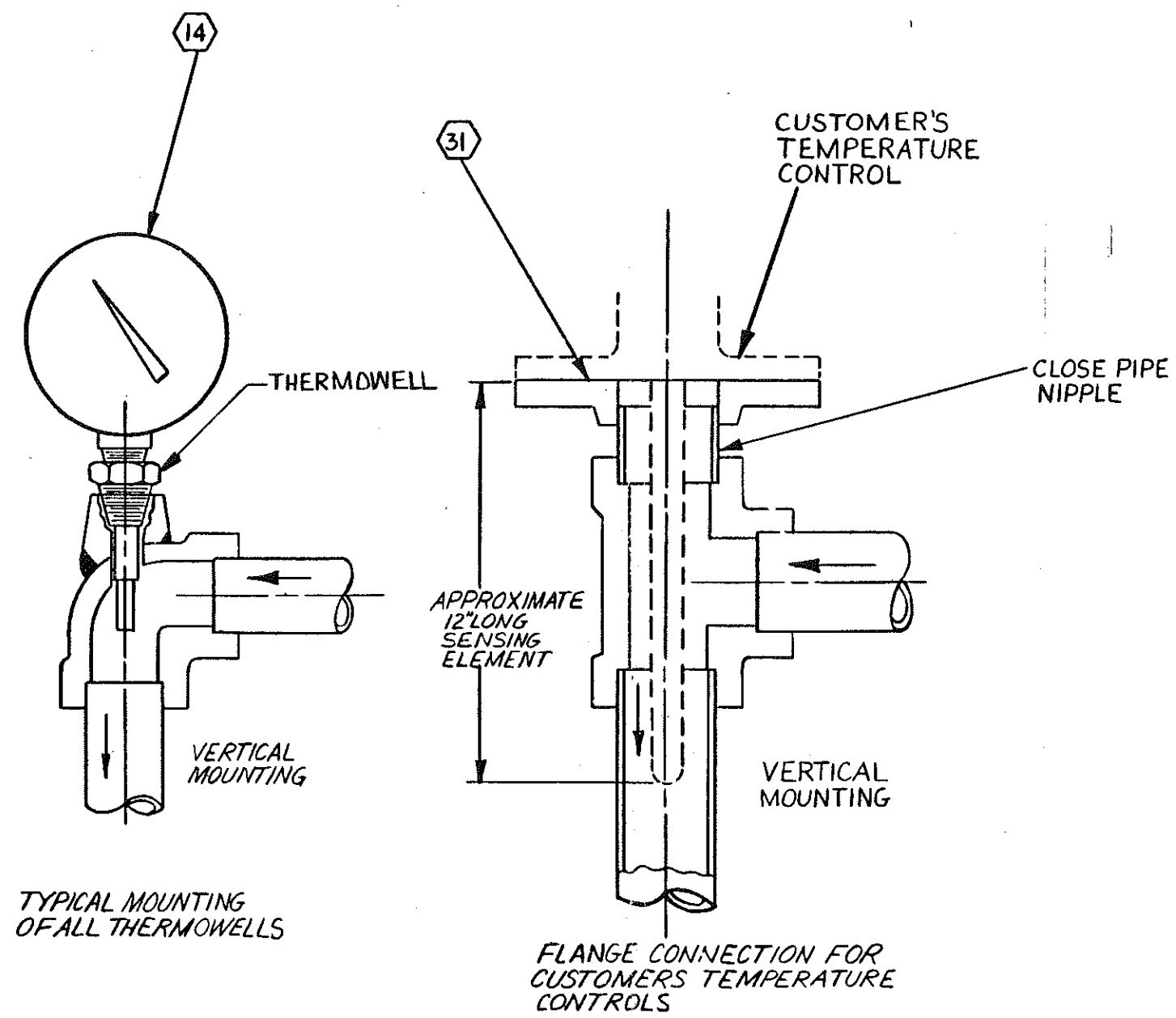
97033C




REVISIONS				
SYM	ZONE	DESCRIPTION	DATE	APPROVED
A	A-4	ADDED TABLE SHIPS SERV	7-1-74	EX 7-1-74
B	C-4	ITEM 20-DELETE B2, RPM WAS 1750	9-20-74	PE 10-474
C		ADDED SHEET #2 ADDED NOTES TO ITEMS # 14 & 31	2-17-75	75-854
D	C-3	960V. WAS 940V - ADD 1 1/2 PIPE	3-3-75	75-2277

DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED
TOLERANCE ON FRACTIONS FOR MACHINED SURFACES
0 TO 1/4 ± .008
OVER 1/4 TO 1 ± .010
OVER 1 TO 2 ± .015
OVER 2 TO 3 ± .020
OVER 3 TO 4 ± .025
OVER 4 TO 5 ± .030
OVER 5 TO 6 ± .035
OVER 6 TO 7 ± .040
OVER 7 TO 8 ± .045
OVER 8 TO 9 ± .050
OVER 9 TO 10 ± .055
OVER 10 TO 12 ± .060
OVER 12 TO 14 ± .065
OVER 14 TO 16 ± .070
OVER 16 TO 18 ± .075
OVER 18 TO 20 ± .080
OVER 20 TO 24 ± .090
OVER 24 TO 28 ± .100
OVER 28 TO 32 ± .110
OVER 32 TO 36 ± .120
OVER 36 TO 40 ± .130
OVER 40 TO 48 ± .140
OVER 48 TO 56 ± .150
OVER 56 TO 64 ± .160
OVER 64 TO 72 ± .170
OVER 72 TO 80 ± .180
OVER 80 TO 88 ± .190
OVER 88 TO 96 ± .200
OVER 96 TO 104 ± .210
OVER 104 TO 112 ± .220
OVER 112 TO 120 ± .230
OVER 120 TO 128 ± .240
OVER 128 TO 136 ± .250
OVER 136 TO 144 ± .260
OVER 144 TO 152 ± .270
OVER 152 TO 160 ± .280
OVER 160 TO 168 ± .290
OVER 168 TO 176 ± .300
OVER 176 TO 184 ± .310
OVER 184 TO 192 ± .320
OVER 192 TO 200 ± .330
OVER 200 TO 208 ± .340
OVER 208 TO 216 ± .350
OVER 216 TO 224 ± .360
OVER 224 TO 232 ± .370
OVER 232 TO 240 ± .380
OVER 240 TO 248 ± .390
OVER 248 TO 256 ± .400
OVER 256 TO 264 ± .410
OVER 264 TO 272 ± .420
OVER 272 TO 280 ± .430
OVER 280 TO 288 ± .440
OVER 288 TO 296 ± .450
OVER 296 TO 304 ± .460
OVER 304 TO 312 ± .470
OVER 312 TO 320 ± .480
OVER 320 TO 328 ± .490
OVER 328 TO 336 ± .500
OVER 336 TO 344 ± .510
OVER 344 TO 352 ± .520
OVER 352 TO 360 ± .530
OVER 360 TO 368 ± .540
OVER 368 TO 376 ± .550
OVER 376 TO 384 ± .560
OVER 384 TO 392 ± .570
OVER 392 TO 400 ± .580
OVER 400 TO 408 ± .590
OVER 408 TO 416 ± .600
OVER 416 TO 424 ± .610
OVER 424 TO 432 ± .620
OVER 432 TO 440 ± .630
OVER 440 TO 448 ± .640
OVER 448 TO 456 ± .650
OVER 456 TO 464 ± .660
OVER 464 TO 472 ± .670
OVER 472 TO 480 ± .680
OVER 480 TO 488 ± .690
OVER 488 TO 496 ± .700
OVER 496 TO 504 ± .710
OVER 504 TO 512 ± .720
OVER 512 TO 520 ± .730
OVER 520 TO 528 ± .740
OVER 528 TO 536 ± .750
OVER 536 TO 544 ± .760
OVER 544 TO 552 ± .770
OVER 552 TO 560 ± .780
OVER 560 TO 568 ± .790
OVER 568 TO 576 ± .800
OVER 576 TO 584 ± .810
OVER 584 TO 592 ± .820
OVER 592 TO 600 ± .830
OVER 600 TO 608 ± .840
OVER 608 TO 616 ± .850
OVER 616 TO 624 ± .860
OVER 624 TO 632 ± .870
OVER 632 TO 640 ± .880
OVER 640 TO 648 ± .890
OVER 648 TO 656 ± .900
OVER 656 TO 664 ± .910
OVER 664 TO 672 ± .920
OVER 672 TO 680 ± .930
OVER 680 TO 688 ± .940
OVER 688 TO 696 ± .950
OVER 696 TO 704 ± .960
OVER 704 TO 712 ± .970
OVER 712 TO 720 ± .980
OVER 720 TO 728 ± .990
OVER 728 TO 736 ± 1.000
OVER 736 TO 744 ± 1.010
OVER 744 TO 752 ± 1.020
OVER 752 TO 760 ± 1.030
OVER 760 TO 768 ± 1.040
OVER 768 TO 776 ± 1.050
OVER 776 TO 784 ± 1.060
OVER 784 TO 792 ± 1.070
OVER 792 TO 800 ± 1.080
OVER 800 TO 808 ± 1.090
OVER 808 TO 816 ± 1.100
OVER 816 TO 824 ± 1.110
OVER 824 TO 832 ± 1.120
OVER 832 TO 840 ± 1.130
OVER 840 TO 848 ± 1.140
OVER 848 TO 856 ± 1.150
OVER 856 TO 864 ± 1.160
OVER 864 TO 872 ± 1.170
OVER 872 TO 880 ± 1.180
OVER 880 TO 888 ± 1.190
OVER 888 TO 896 ± 1.200
OVER 896 TO 904 ± 1.210
OVER 904 TO 912 ± 1.220
OVER 912 TO 920 ± 1.230
OVER 920 TO 928 ± 1.240
OVER 928 TO 936 ± 1.250
OVER 936 TO 944 ± 1.260
OVER 944 TO 952 ± 1.270
OVER 952 TO 960 ± 1.280
OVER 960 TO 968 ± 1.290
OVER 968 TO 976 ± 1.300
OVER 976 TO 984 ± 1.310
OVER 984 TO 992 ± 1.320
OVER 992 TO 1000 ± 1.330
OVER 1000 TO 1008 ± 1.340
OVER 1008 TO 1016 ± 1.350
OVER 1016 TO 1024 ± 1.360
OVER 1024 TO 1032 ± 1.370
OVER 1032 TO 1040 ± 1.380
OVER 1040 TO 1048 ± 1.390
OVER 1048 TO 1056 ± 1.400
OVER 1056 TO 1064 ± 1.410
OVER 1064 TO 1072 ± 1.420
OVER 1072 TO 1080 ± 1.430
OVER 1080 TO 1088 ± 1.440
OVER 1088 TO 1096 ± 1.450
OVER 1096 TO 1104 ± 1.460
OVER 1104 TO 1112 ± 1.470
OVER 1112 TO 1120 ± 1.480
OVER 1120 TO 1128 ± 1.490
OVER 1128 TO 1136 ± 1.500
OVER 1136 TO 1144 ± 1.510
OVER 1144 TO 1152 ± 1.520
OVER 1152 TO 1160 ± 1.530
OVER 1160 TO 1168 ± 1.540
OVER 1168 TO 1176 ± 1.550
OVER 1176 TO 1184 ± 1.560
OVER 1184 TO 1192 ± 1.570
OVER 1192 TO 1200 ± 1.580
OVER 1200 TO 1208 ± 1.590
OVER 1208 TO 1216 ± 1.600
OVER 1216 TO 1224 ± 1.610
OVER 1224 TO 1232 ± 1.620
OVER 1232 TO 1240 ± 1.630
OVER 1240 TO 1248 ± 1.640
OVER 1248 TO 1256 ± 1.650
OVER 1256 TO 1264 ± 1.660
OVER 1264 TO 1272 ± 1.670
OVER 1272 TO 1280 ± 1.680
OVER 1280 TO 1288 ± 1.690
OVER 1288 TO 1296 ± 1.700
OVER 1296 TO 1304 ± 1.710
OVER 1304 TO 1312 ± 1.720
OVER 1312 TO 1320 ± 1.730
OVER 1320 TO 1328 ± 1.740
OVER 1328 TO 1336 ± 1.750
OVER 1336 TO 1344 ± 1.760
OVER 1344 TO 1352 ± 1.770
OVER 1352 TO 1360 ± 1.780
OVER 1360 TO 1368 ± 1.790
OVER 1368 TO 1376 ± 1.800
OVER 1376 TO 1384 ± 1.810
OVER 1384 TO 1392 ± 1.820
OVER 1392 TO 1400 ± 1.830
OVER 1400 TO 1408 ± 1.840
OVER 1408 TO 1416 ± 1.850
OVER 1416 TO 1424 ± 1.860
OVER 1424 TO 1432 ± 1.870
OVER 1432 TO 1440 ± 1.880
OVER 1440 TO 1448 ± 1.890
OVER 1448 TO 1456 ± 1.900
OVER 1456 TO 1464 ± 1.910
OVER 1464 TO 1472 ± 1.920
OVER 1472 TO 1480 ± 1.930
OVER 1480 TO 1488 ± 1.940
OVER 1488 TO 1496 ± 1.950
OVER 1496 TO 1504 ± 1.960
OVER 1504 TO 1512 ± 1.970
OVER 1512 TO 1520 ± 1.980
OVER 1520 TO 1528 ± 1.990
OVER 1528 TO 1536 ± 2.000
OVER 1536 TO 1544 ± 2.010
OVER 1544 TO 1552 ± 2.020
OVER 1552 TO 1560 ± 2.030
OVER 1560 TO 1568 ± 2.040
OVER 1568 TO 1576 ± 2.050
OVER 1576 TO 1584 ± 2.060
OVER 1584 TO 1592 ± 2.070
OVER 1592 TO 1600 ± 2.080
OVER 1600 TO 1608 ± 2.090
OVER 1608 TO 1616 ± 2.100
OVER 1616 TO 1624 ± 2.110
OVER 1624 TO 1632 ± 2.120
OVER 1632 TO 1640 ± 2.130
OVER 1640 TO 1648 ± 2.140
OVER 1648 TO 1656 ± 2.150
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OVER 1664 TO 1672 ± 2.170
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OVER 1680 TO 1688 ± 2.190
OVER 1688 TO 1696 ± 2.200
OVER 1696 TO 1704 ± 2.210
OVER 1704 TO 1712 ± 2.220
OVER 1712 TO 1720 ± 2.230
OVER 1720 TO 1728 ± 2.240
OVER 1728 TO 1736 ± 2.250
OVER 1736 TO 1744 ± 2.260
OVER 1744 TO 1752 ± 2.270
OVER 1752 TO 1760 ± 2.280
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OVER 1792 TO 1800 ± 2.330
OVER 1800 TO 1808 ± 2.340
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OVER 1840 TO 1848 ± 2.390
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OVER 1856 TO 1864 ± 2.410
OVER 1864 TO 1872 ± 2.420
OVER 1872 TO 1880 ± 2.430
OVER 1880 TO 1888 ± 2.440
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OVER 1896 TO 1904 ± 2.460
OVER 1904 TO 1912 ± 2.470
OVER 1912 TO 1920 ± 2.480
OVER 1920 TO 1928 ± 2.490
OVER 1928 TO 1936 ± 2.500
OVER 1936 TO 1944 ± 2.510
OVER 1944 TO 1952 ± 2.520
OVER 1952 TO 1960 ± 2.530
OVER 1960 TO 1968 ± 2.540
OVER 1968 TO 1976 ± 2.550
OVER 1976 TO 1984 ± 2.560
OVER 1984 TO 1992 ± 2.570
OVER 1992 TO 2000 ± 2.580
OVER 2000 TO 2008 ± 2.590
OVER 2008 TO 2016 ± 2.600
OVER 2016 TO 2024 ± 2.610
OVER 2024 TO 2032 ± 2.620
OVER 2032 TO 2040 ± 2.630
OVER 2040 TO 2048 ± 2.640
OVER 2048 TO 2056 ± 2.650
OVER 2056 TO 2064 ± 2.660
OVER 2064 TO 2072 ± 2.670
OVER 2072 TO 2080 ± 2.680
OVER 2080 TO 2088 ± 2.690
OVER 2088 TO 2096 ± 2.700
OVER 2096 TO 2104 ± 2.710
OVER 2104 TO 2112 ± 2.720
OVER 2112 TO 2120 ± 2.730
OVER 2120 TO 2128 ± 2.740
OVER 2128 TO 2136 ± 2.750
OVER 2136 TO 2144 ± 2.760
OVER 2144 TO 2152 ± 2.770
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OVER 2176 TO 2184 ± 2.810
OVER 2184 TO 2192 ± 2.820
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OVER 2200 TO 2208 ± 2.840
OVER 2208 TO 2216 ± 2.850
OVER 2216 TO 2224 ± 2.860
OVER 2224 TO 2232 ± 2.870
OVER 2232 TO 2240 ± 2.880
OVER 2240 TO 2248 ± 2.890
OVER 2248 TO 2256 ± 2.900
OVER 2256 TO 2264 ± 2.910
OVER 2264 TO 2272 ± 2.920
OVER 2272 TO 2280 ± 2.930
OVER 2280 TO 2288 ± 2.940
OVER 2288 TO 2296 ± 2.950
OVER 2296 TO 2304 ± 2.960
OVER 2304 TO 2312 ± 2.970
OVER 2312 TO 2320 ± 2.980
OVER 2320 TO 2328 ± 2.990
OVER 2328 TO 2336 ± 3.000
OVER 2336 TO 2344 ± 3.010
OVER 2344 TO 2352 ± 3.020
OVER 2352 TO 2360 ± 3.030
OVER 2360 TO 2368 ± 3.040
OVER 2368 TO 2376 ± 3.050
OVER 2376 TO 2384 ± 3.060
OVER 2384 TO 2392 ± 3.070
OVER 2392 TO 2400 ± 3.080
OVER 2400 TO 2408 ± 3.090
OVER 2408 TO 2416 ± 3.100
OVER 2416 TO 2424 ± 3.110
OVER 2424 TO 2432 ± 3.120
OVER 2432 TO 2440 ± 3.130
OVER 2440 TO 2448 ± 3.140
OVER 2448 TO 2456 ± 3.150
OVER 2456 TO 2464 ± 3.160
OVER 2464 TO 2472 ± 3.170
OVER 2472 TO 2480 ± 3.180
OVER 2480 TO 2488 ± 3.190
OVER 2488 TO 2496 ± 3.200
OVER 2496 TO 2504 ± 3.210
OVER 2504 TO 2512 ± 3.220
OVER 2512 TO 2520 ± 3.230
OVER 2520 TO 2528 ± 3.240
OVER 2528 TO 2536 ± 3.250
OVER 2536 TO 2544 ± 3.260
OVER 2544 TO 2552 ± 3.270
OVER 2552 TO 2560 ± 3.280
OVER 2560 TO 2568 ± 3.290
OVER 2568 TO 2576 ± 3.300
OVER 2576 TO 2584 ± 3.310
OVER 2584 TO 2592 ± 3.320
OVER 2592 TO 2600 ± 3.330
OVER 2600 TO 2608 ± 3.340
OVER 2608 TO 2616 ± 3.350
OVER 2616 TO 2624 ± 3.360
OVER 2624 TO 2632 ± 3.370
OVER 2632 TO 2640 ± 3.380
OVER 2640 TO 2648 ± 3.390
OVER 2648 TO 2656 ± 3.400
OVER 2656 TO 2664 ± 3.410
OVER 2664 TO 2672 ± 3.420
OVER 2672 TO 2680 ± 3.430
OVER 2680 TO 2688 ± 3.440
OVER 2688 TO 2696 ± 3.450
OVER 2696 TO 2704 ± 3.460
OVER 2704 TO 2712 ± 3.470
OVER 2712 TO 2720 ± 3.480
OVER 2720 TO 2728 ± 3.490
OVER 2728 TO 2736 ± 3.500
OVER 2736 TO 2744 ± 3.510
OVER 2744 TO 2752 ± 3.520
OVER 2752 TO 2760 ± 3.530
OVER 2760 TO 2768 ± 3.540
OVER 2768 TO 2776 ± 3.550
OVER 2776 TO 2784 ± 3.560
OVER 2784 TO 2792 ± 3.570
OVER 2792 TO 2800 ± 3.580
OVER 2800 TO 2808 ± 3.590
OVER 2808 TO 2816 ± 3.600
OVER 2816 TO 2824 ± 3.610
OVER 2824 TO 2832 ± 3.620
OVER 2832 TO 2840 ± 3.630
OVER 2840 TO 2848 ± 3.640
OVER 2848 TO 2856 ± 3.650
OVER 2856 TO 2864 ± 3.660
OVER 2864 TO 2872 ± 3.670
OVER 2872 TO 2880 ± 3.680
OVER 2880 TO 2888 ± 3.690
OVER 2888 TO 2896 ± 3.700
OVER 2896 TO 2904 ± 3.710
OVER 2904 TO 2912 ± 3.720
OVER 2912 TO 2920 ± 3.730
OVER 2920 TO 2928 ± 3.740
OVER 2928 TO 2936 ± 3.750
OVER 2936 TO 2944 ± 3.760
OVER 2944 TO 2952 ± 3.770
OVER 2952 TO 2960 ± 3.780
OVER 2960 TO 2968 ± 3.790
OVER 2968 TO 2976 ± 3.800
OVER 2976 TO 2984 ± 3.810
OVER 2984 TO 2992 ± 3.820
OVER 2992 TO 3000 ± 3.830
OVER 3000 TO 3008 ± 3.840
OVER 3008 TO 3016 ± 3.850
OVER 3016 TO 3024 ± 3.860
OVER 3024 TO 3032 ± 3.870
OVER 3032 TO 3040 ± 3.880
OVER 3040 TO 3048 ± 3.890
OVER 3048 TO 3056 ± 3.900
OVER 3056 TO 3064 ± 3.910
OVER 3064 TO 3072 ± 3.920
OVER 3072 TO 3080 ± 3.930
OVER 3080 TO 3088 ± 3.940
OVER 3088 TO 3096 ± 3.950
OVER 3096 TO 3104 ± 3.960
OVER 3104 TO 3112 ± 3.970
OVER 3112 TO 3120 ± 3.980
OVER 3120 TO 3128 ± 3.990
OVER 3128 TO 3136 ± 4.000
OVER 3136 TO 3144 ± 4.010
OVER 3144 TO 3152 ± 4.020
OVER 3152 TO 3160 ± 4.030
OVER 3160 TO 3168 ± 4.040
OVER 3168 TO 3176 ± 4.050
OVER 3176 TO 3184 ± 4.060
OVER 3184 TO 3192 ± 4.070
OVER 3192 TO 3200 ± 4.080
OVER 3200 TO 3208 ± 4.090
OVER 3208 TO 3216 ± 4.100
OVER 3216 TO 3224 ± 4.110
OVER 3224 TO 3232 ± 4.120
OVER 3232 TO 3240 ± 4.130
OVER 3240 TO 3248 ± 4.140
OVER 3248 TO 3256 ± 4.150
OVER 3256 TO 3264 ± 4.160
OVER 3264 TO 3272 ± 4.170
OVER 3272 TO 3280 ± 4.180
OVER 3280 TO 3288 ± 4.190
OVER 3288 TO 3296 ± 4.200
OVER 3296 TO 3304 ± 4.210
OVER 3304 TO 3312 ± 4.220
OVER 3312 TO 3320 ± 4.230
OVER 3320 TO 3328 ± 4.240
OVER 3328 TO 3336 ± 4.250
OVER 3336 TO 3344 ± 4.260
OVER 3344 TO 3352 ± 4.270
OVER 3352 TO 3360 ± 4.280
OVER 3360 TO 3368 ± 4.290
OVER 3368 TO 3376 ± 4.300
OVER 3376 TO 3384 ± 4.310
OVER 3384 TO 3392 ± 4.320
OVER 3392 TO 3400 ± 4.330
OVER 3400 TO 3408 ± 4.340
OVER 3408 TO 3416 ± 4.350
OVER 3416 TO 3424 ± 4.360
OVER 3424 TO 3432 ± 4.370
OVER 3432 TO 3440 ± 4.380
OVER 3440 TO 3448 ± 4.390
OVER 3448 TO 3456 ± 4.400
OVER 3456 TO 3464 ± 4.410
OVER 3464 TO 3472 ± 4.420
OVER 3472 TO 3480 ± 4.430
OVER 3480 TO 3488 ± 4.440
OVER 3488 TO 3496 ± 4.450
OVER 3496 TO 3504 ± 4.460
OVER 3504 TO 3512 ± 4.470
OVER 3512 TO 3520 ± 4.480
OVER 3520 TO 3528 ± 4.490
OVER 3528 TO 3536 ± 4.500
OVER 3536 TO 3544 ± 4.510
OVER 3544 TO 3552 ± 4.520
OVER 3552 TO 3560 ± 4.530
OVER 3560 TO 3568 ± 4.540
OVER 356

REVISIONS					
SYM	ZONE	DESCRIPTION	DATE	APPROVED	ECN
C		ADD SHT #2	D.W.T 2-17-75	EJD 2-19-75	75-854
D		SEE SHEET 1 OF 2	75-0 5-18-75		75-2377



FAMILY NO. 215,021		LOCATION K52	
 TERRY WINDSOR, CONN., U.S.A.		TITLE <i>FM-6-XA OIL PIPING DIAG. GEAR + GENERATOR</i>	
		STANDARD PRACTICE-	
SCALE: <i>NONE</i>		DATE <i>2-18-75</i>	
DRAWN: <i>T.G.R.</i>	CHECKED:	APPROVED:	
ENGINEERING APPROVAL			
SIGNED:		DATE:	
TYPE: <i>FM-6-XA</i>		REF. DWG NO.	
DRAWING NO. <i>97033C</i>		SHEET 2 OF 2	

BRUNING 44-132 23582

97033C

The Terry Steam Turbine Co.

BILL OF MATERIAL

DRM W.O. 41 S

ITEM NO.	PIECE NO.	PATT. OR FORGING NO.	PART	DWG. NO.	MATERIAL	NO. PER TURB.
1			PUMP, OIL W/MOTOR	99622B		1
			CONSISTING OF:			
2	75105A03		PUMP, OIL	75105A		1
3	75106A		COUPLING	75106A		1
4	75107A		MOTOR	75107A		1
5	49334		KEY - SQUARE	A1259X	EM-90	1
6			KEY - #808 WOODRUFF	STD	EM-90	1
7			FLANGE 1 1/4-150# ANSI S.W. R.F.			
			FLANGE		ASTM A-182 GD-2 CARBON STEEL	1
			PIPE - 1 1/4 SCH 80 SEAMLESS			
			2 1/2" LONG THREADED ONE END		ASTM A-106 TYPE B CARBON STEEL	1
9			ELBOW - 3000# 1 1/4 NPT		ASTM A-181 GD-2 CARBON STEEL	2
10			PIPE 1 1/4 SCH 80 SEAMLESS			
			16 1/4 LONG THREADED BOTH ENDS		ASTM A-106 TYPE B CARBON STEEL	1
11			PIPE 1 1/4 SCH 80 SEAMLESS 4 1/2			
			LONG THREADED BOTH ENDS		ASTM A-106 TYPE B CARBON STEEL	1
12			STREET ELL - 3000# 1 1/4 NPT			
			(INTERNAL & EXTERNAL)		ASTM A-181 GD-2 CARBON STEEL	1
13			SCREW 1/2-13 UNC-2A HEX HD CAP			
			1 1/2 LONG	STD	STEEL	2
14			WASHER - 1/2 PLAIN (STD WT)	STD	STEEL	2
15			WASHER LOCK 1/2 MEDIUM WEIGHT	STD	STEEL	2
16			SCREW, 1/4-20 UNC-2A HEX HD CAP			
			1/2" LONG	STD	STEEL	2
TITLE				REV. AND CHG. NO.	24-4624	
PAGE 1 of 2						

BM NO. 9-99624-1

BY JJH

DATE 7/24/74

TYPE FM6

FILE

The Terry Steam Turbine Co.

[illegible]

OIL PUMP W/MOTOR
L-1918
PAGE 2 of 2

REV.
AND
CHG.
NO.

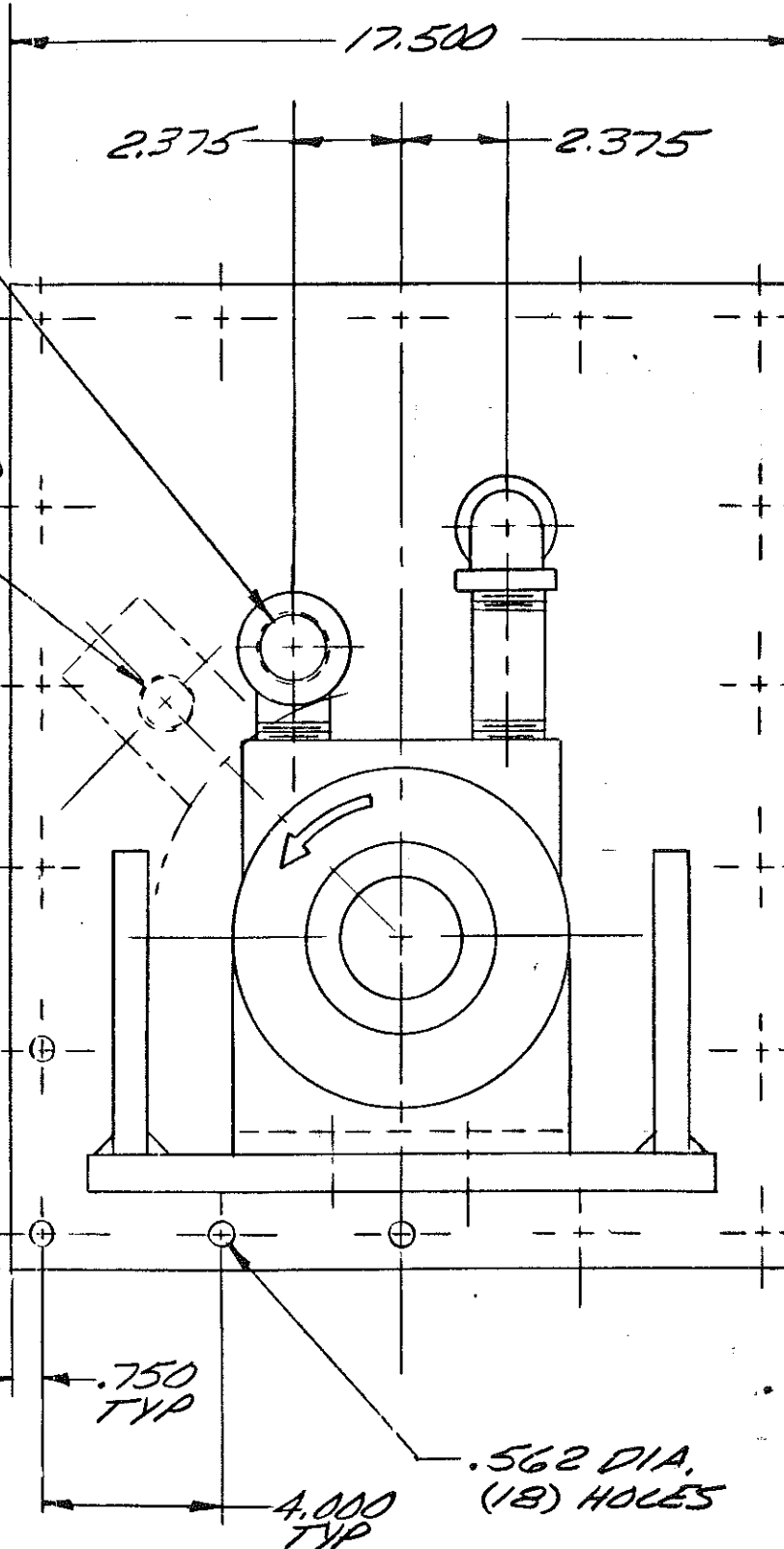
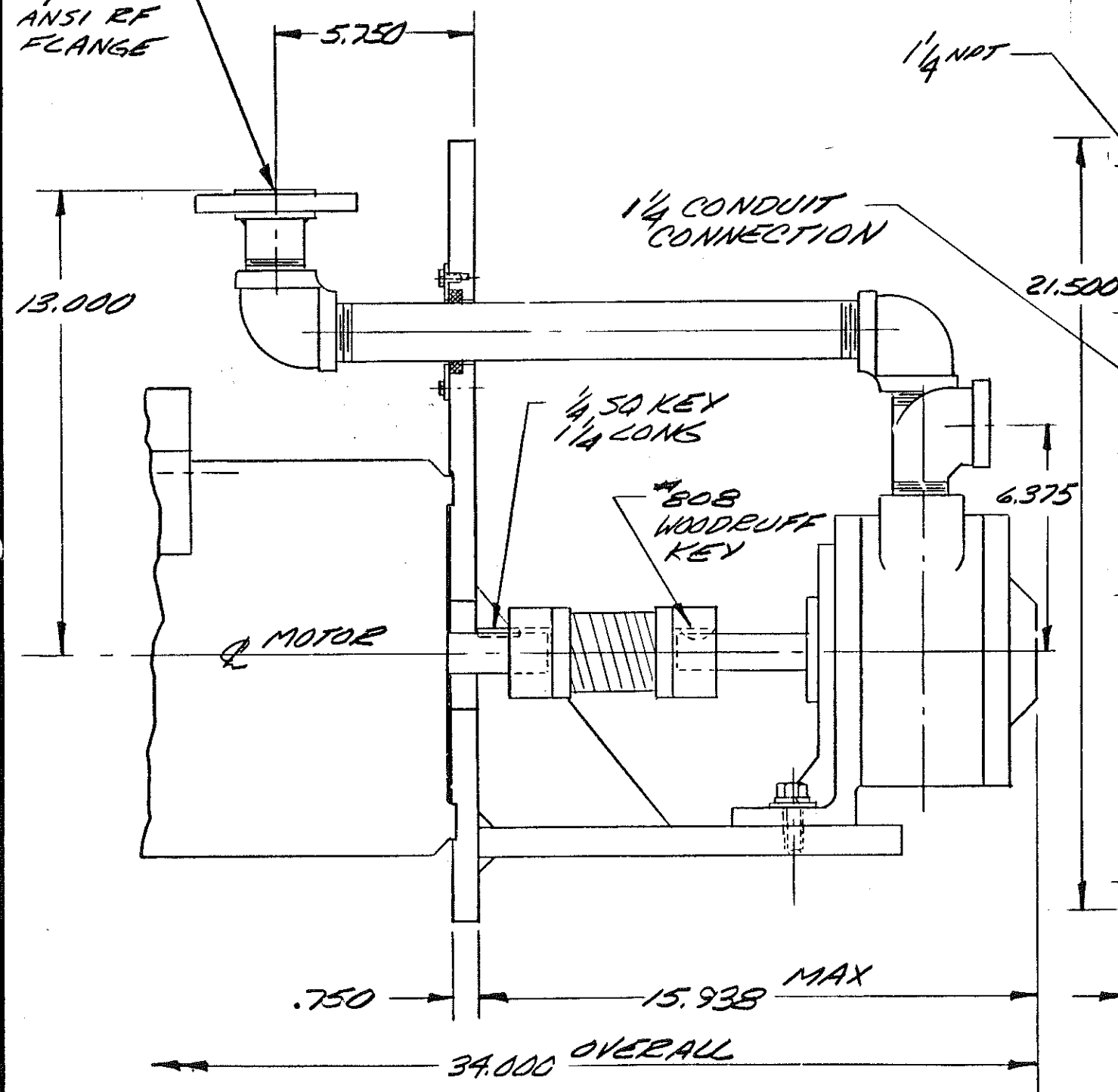
74-4624

M₂

99622B

99622B

1 1/4"-150 #
ANSI RF
FLANGE



(A) MOTOR: 1150 RPM 3 HP
CLASS B INSULATION
460V 3 PH 60 HZ

PUMP:
LIQUID- LUBE OIL
GPM 40
PRESSURE 50 PSI

NOTES:

1. FOR BILL OF MATERIAL SEE 9-99624
2. FOR ASSEMBLY & DIMENSIONAL DATA SEE LAYOUT C1918

DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED
TOLERANCE ON FRACTIONS FOR MACHINED SURFACES
0 TO 1/4 ± .008
OVER 1/4 TO 24 ± 1/64
OVER 24 TO 72 ± 1/32
OVER 72 ± 1/16

REAMED HOLE TOLERANCE IS ± .001

INSIDE MACHINED CORNERS
TO HAVE A RADIUS OF 3/64 ± 0
OUT OF ROUNDNESS, ECCENTRICITY OR UNINTENTIONAL
TAPER TO BE WITHIN THE DIAMETRAL TOLERANCE
SPECIFIED.

FILE

TYPE-

OIL PUMP W/MOTOR
SCALE NONE DATE 7-19-74

THE TERRY STEAM TURBINE CO.
WINDSOR, CONN., U. S. A.

DRAWN HAM
TRACED
CHECKED
APPROVE

99622B

A

WAS CLASS A

J.J.H. 8-27-74

99622B

INSTALLATION AND SERVICE INSTRUCTIONS FOR SERIES CE AND CF PUMPS

GENERAL DESCRIPTION

Types -----	Page 1
Pumping Principle -----	Page 1
Pump Selection -----	Page 2

INSTALLATION

Preparation -----	Page 3
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Strainer Protection -----	Page 3
Points to Follow -----	Page 4

SERVICE

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Pump Disassembly & Inspection -----	Page 6
Re-assembly of Pump -----	Page 6

FIELD CHECK-LIST

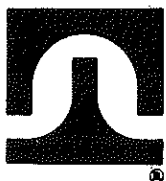
What to Look For -----	Page 7
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REPLACEMENT PARTS LIST

Model CE and CEN -----	Page 9
Model CF, CFN and CFA -----	Page 10

HANDLE WITH CARE -----	Page 11
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RELIEF VALVES -----	Page 11
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TUTHILL PUMP COMPANY

12500 So. Crawford Avenue, Chicago, Illinois 60658

Telephone • Area Code 312 • 389-2500

GENERAL DESCRIPTION

TYPES

Model CE Pumps are sleeve bearing lip seal units with integral mounting foot, designed for direct drive service.

Model CF Pumps are sleeve bearing, lip seal units, flange mounting style, designed for direct drive service.

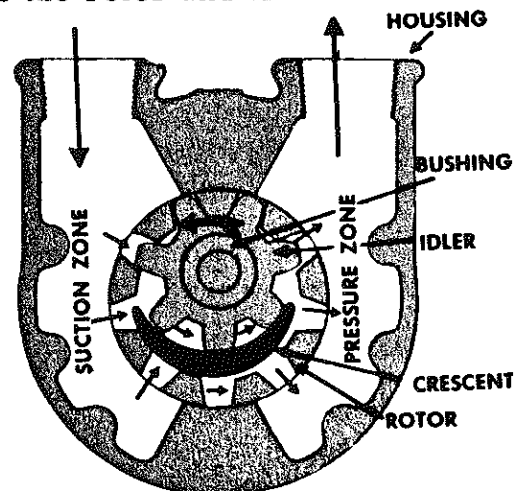
Model CEN Pumps are sleeve and ball bearing units with lip seal and integral mounting foot designed for indirect (belt, chain, gear, etc.) drive.

Model CFN Pumps are sleeve and ball bearing lip seal units with flange mounting style, designed for indirect drive.

All Series CE-CF pumps can be supplied with special mechanical seals, automatic reversing (Style "R") feature and steam jackets (through which steam or other heating medium may be forced to melt or reduce the viscosity of materials to permit rotation of the pump at starting. Conversely, when desirable, cooling water may be forced through these jackets). Series CE-CF pumps can also be supplied with valve in cover.

PUMPING PRINCIPLE

Tuthill internal-gear principle is based upon the use of a rotor, idler gear and a crescent-shaped partition that is cast integrally with the cover. (See accompanying figure.) Thus, only two moving parts comprise this efficient pumping element. Power is applied to the rotor and transmitted to the idler gear with which it meshes. The space between the outside diameter of the idler and the inside diameter of the rotor is sealed by the crescent. When the pump is started, there is an increase in volume as the teeth come out of mesh. This creates a partial vacuum, drawing the liquid into the pump through the suction port. The liquid fills the spaces between the teeth of the idler and rotor, and is carried past the crescent partition to the pressure side of the pump. When the teeth mesh on the pressure side, the liquid is forced from the spaces and out through the discharge port.



PUMP SELECTION

The table below shows the capacity and suggested driving motor size for different speeds and pressures. These figures are based upon pumping a liquid of about 200 S. S. U. viscosity, and with a 10 inch vacuum. While Tuthill pumps will develop as high as 27 inches of vacuum, it is sound engineering to reduce the vacuum to a minimum. The speed of the pump must be reduced when handling liquids of high viscosity and the size on lines increased to prevent cavitation, loss of capacity and high power requirements.

Caution: Remember that the pipe-line friction increases at a rapid rate with increase in viscosity. For a given pump and motor, larger pipe lines are necessary to maintain the same pump pressure when changing from a thin liquid to a thick liquid. Viscous liquid pumping installations are notoriously underpowered, due to lack of knowledge in computing pipe line friction. Handling of viscous liquids is a special hydraulic engineering problem which the Engineering Department of Tuthill is well-equipped to solve for you.

Consult the Tuthill Pump Company in selecting the proper pump, size of motor and pipe-line size for your job, giving them the following information:

1. Capacity required.
2. Maximum and minimum liquid temperature when entering the pump.
3. The viscosity at the minimum temperature.
4. Total length of suction pipe and discharge pipe.
5. Suction lift and height to which the pump must force the liquid.

PUMP CAPACITIES WITH SUGGESTED DRIVING MOTOR SIZES

Pump Speed		1800 R.P.M.						1200 R.P.M.						900 R.P.M.					
Operating Pressure P.S.I.		10		50		100		10		50		100		10		50		100	
		GPM	H.P.	GPM	H.P.	GPM	H.P.	GPM	H.P.	GPM	H.P.	GPM	H.P.	GPM	H.P.	GPM	H.P.	GPM	H.P.
Pump Size	2	9	1/2	8	3/4	7	1	6 1/2	1/3	6	1/2	5 1/2	3/4	5	1/4	4 1/2	1/3	4	1/2
	3	18	1	17	1 1/2	16	3	12	1/2	11 1/2	1	11	1 1/2	9	1/3	8 1/2	3/4	8	1
	4	37	1 1/2	36	3	35	5	24	1	23 1/2	1 1/2	23	3	18	3/4	17 1/2	1	17	1 1/2
	5	62	3	61	5	60	7 1/2	40	1 1/2	39	3	38	5	30	1	29	2	28	3
	6	84	5	83	7 1/2	82	10	56	3	55	5	54	7 1/2	42	2	40	3	38	5

150 P.S.I. Discharge pressure permissible for intermittent service.

INSTALLATION

PREPARATION

A large percentage of unsatisfactory pump installations is caused by failure to observe the natural laws limiting the suction lifts on volatile materials. At temperatures of approximately 70° F. or lower, kerosene and light fuel oils may be pumped at nearly full volumetric efficiency when combined vertical lift and friction in the suction line do not cause a vacuum to exceed 10 inches of mercury at the suction port of the pump. Ten inches vacuum on kerosene oil is equal to approximately fourteen feet of vertical lift without pipe friction. This varies with the temperature and various oils, but if, in laying out the suction line, the maximum vacuum is kept at this figure or lower, good results may be expected. If this vacuum is exceeded, it is almost certain to result in cavitation, loss of volume and a noisy installation.

LOCATION

The pump should be located as close to the source of supply as conditions will permit, below the level of the liquid in the reservoir, if possible. Pumps should be located in a dry and clean place, with space to work around them. When necessary to locate pumps in pits, provisions should be made to safeguard against floods. Care must be taken to properly support the suction and discharge piping so that no strain can be put on the pump from either its weight or expansion. Piping strains are very often the cause of misalignment, hot bearings, worn couplings and vibrations.

STRAINER PROTECTION

Piping or tubing should be cleaned out thoroughly to remove chips and pipe scale before connecting the piping to the pump. Neglect of this precaution may result in damage to the pump when it is put in operation. The suction piping should be as short and direct as possible. Grit, pipe chips, or other foreign substance that is allowed to pass through the pump, will almost surely injure and possibly ruin it. Always remember the following in the selection and positioning of a strainer:

1. A strainer should be installed to protect the pump wherever conditions permit.
2. When uncertain of pressure drop through the strainer, obtain this data from manufacturer, giving pump capacity and type of liquid to be handled.
3. Install strainer according to arrows or notation designating flow.
4. Have strainer accessible for servicing.
5. Use duplex type where shutdown during servicing is not permitted.
6. Provide a vacuum gauge in the suction line for determining when the strainer requires cleaning.
7. The greater the free opening, the less attention the strainer will require.

POINTS TO FOLLOW FOR PROPER INSTALLATION

Pumps should always be installed with both ports pointing upwards to insure proper priming. If it becomes necessary to install the pump with the ports pointed to the side, then the top port should be the suction port. When pipe lines are installed, an inverted "U" bend should be incorporated in the suction line close to the pump to trap liquid in the pump for priming. The suction line must be kept free from air leaks and air pockets.

When handling liquids of high viscosity, such as asphalt, heavy gear lubricants, linseed oil, Bunker "C" fuel oil, molasses, etc., the speed of the pumps and the running clearances are important. Consult the Tuthill Pump Company whenever unusual conditions of speed, pressure, vacuum or viscosity are encountered.

Before initial start of pump, it is recommended that some of the liquid to be pumped be introduced into the pump ports to insure wetting of the rotation elements. Check alignment and rotation of the driver to see that pump will rotate in the designated proper direction of rotation.

SERVICE

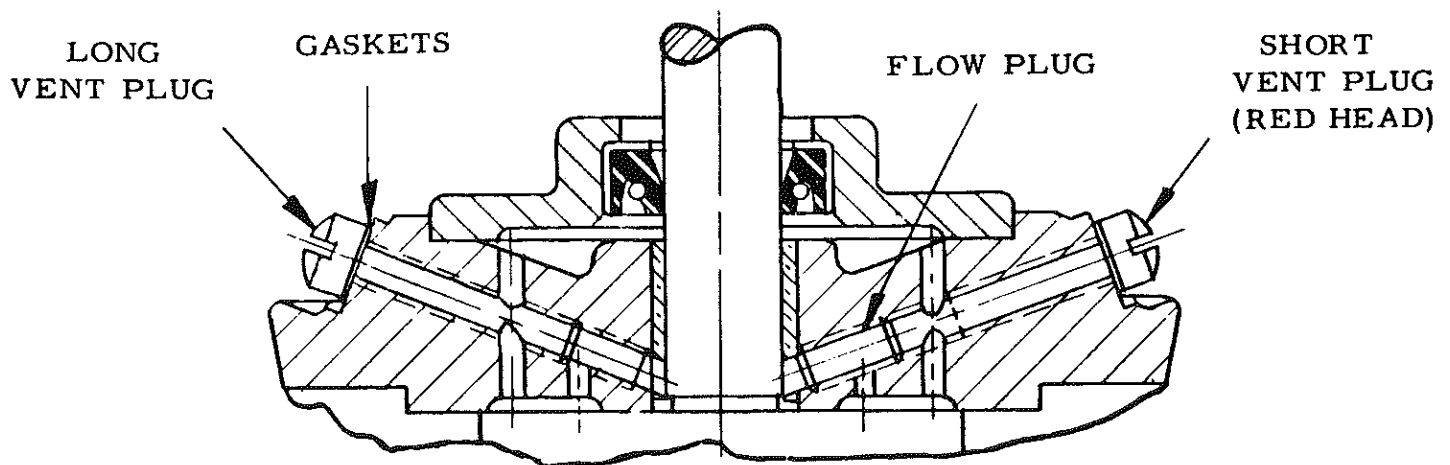
SEAL REPLACEMENT

Model CE-CF:

1. Grip pump firmly across ports and opposite side of housing in vise with shaft end up.
2. Remove three cap screws and slide seal housing cap assembly off shaft.
3. Pry seal (CF94) from housing cap (CF68), clean out seal cavity with cloth. Press new seal (CF94) into housing cap with lip spring side facing mounting face.
4. Inspect shaft. If badly scored at seal area, rotor should be replaced. Carefully remove sharp edges from shaft and polish with crocus cloth. This will eliminate possible damage to the seal lip and assist in easy installation.
5. Install new gasket (CF74) into bracket.
6. Apply a dab of vasoline to the seal lip and install over shaft. (Caution: Seal lip must retain its position on shaft). Work housing cap assembly up and down on shaft to make certain that seal lip slides freely. Rotate to align holes in cap flange with tapped holes in pump bracket. Insert and tighten cap screws.

1. Grip pump firmly across ports and opposite side of housing in vise with shaft end up.
2. Determine direction of rotation of pump.
3. Loosen set screw in collar on outboard ball bearing and by turning bearing lock collar in direction opposite to the pump direction of rotation while holding shaft still, will permit removal from bearing inner ring.
4. Remove three cap screws and slide housing cap assembly off shaft.
5. Pry seal (CF94) from housing cap (CEN68), clean out seal cavity with cloth. Press new seal (CF94) into housing cap with lip spring side facing mounting face.
6. Inspect shaft. If badly scored at seal area, rotor should be replaced. Carefully remove sharp edges from shaft and polish with crocus cloth. This will eliminate possible damage to the seal lip and assist in easy installation.
7. Install new gasket (CF74) into bracket.
8. Apply a dab of vasoline to the seal lip and install over shaft. (Caution: Seal lip must retain its position on shaft.) Work housing cap assembly up and down on shaft to make certain that seal lip slides freely. Rotate to align holes in cap flange with tapped holes in pump bracket. Insert and tighten cap screws.
9. Tighten bearing lock by holding shaft still and turning lock collar in direction of pump rotation. Tighten set screw in collar to shaft.

Important: The seal chamber is vented to the suction side of the pump. For Models CE and CEN, the short vent plug (painted red) must always be on the suction side of the pump.



Sectional view shows seal chamber vented to suction. The short plug, painted red, is installed on the suction side of seal chamber. If rotation is reversed, short plug and flow plug must be interchanged with long plug.

When it is necessary to reverse the shaft rotation of Model CF and CFN pumps:

1. Loosen cover cap screws free from bracket.
2. Revolve bracket 180° so that vent hole to the seal chamber is located on the new suction side.
3. Align mounting holes and tighten cover cap screws.

PUMP DISASSEMBLY & INSPECTION

1. Remove housing cap (CE68 or CEN68) as described under instructions for Seal Replacement.
2. Mark cover, housing and bracket for proper reassembly.
3. Remove cover cap screws, cover, housing, idler, and rotor from bracket and thoroughly clean all parts.
4. The individual parts should be inspected for damage. The keyway in the end of the rotor shaft must be in good condition. There must not be any grooves or deep scratches on the following surfaces:
 - a. The I. D. surface in the housing.
 - b. The O. D. of the rotor.
 - c. The end face of the rotor.
 - d. The O. D. of the idler.
 - e. Both faces on the idler.
 - f. The inside surfaces of the cover including the surfaces on the crescent.
5. The rotor should be positioned in bracket and checked for clearance in the bearing. The shaft must turn freely without any detectable side play. Excessive side play will require replacement of the housing, bracket, rotor or all three parts.
6. The idler must turn freely on the idler pin in the pump cover without any detectable side play.

REASSEMBLY OF PUMP

1. Clean all parts thoroughly, using great care to eliminate all dirt.
2. Install rotor in bracket.
3. Position a minimum of .006" total thickness of plastic material gaskets over mounting registers of each bracket and cover.
(Caution: A minimum of .006" thick gaskets are required to prevent bracket and cover registers from bottoming in housing C' Bores)

NOTE: Gaskets of various thickness are supplied so that proper internal end clearances are obtained. This clearance depends upon the size of pump and viscosity of the lubricant being handled. Select gasket thickness to obtain minimum end clearances as follows:

#2 Size Pump	.001" to .002" Clearance
#3 & #4 Size Pumps	.002" to .003" Clearance
#5 & #6 Size Pumps	.003" to .005" Clearance

4. Install housing over rotor head and position on bracket register.
5. Apply idler to cover and position in housing register. Align matching marks for proper location. In "R" series pumps, check

position of boss on cover to be certain it is located on the suction side of the pump. Check position of vent plugs in bracket.

6. Install cover cap screws.

NOTE: Pull down gradually and evenly when tightening cap screws. The shaft should be revolved slowly as the cap screws are tightened gradually. Not one fastened down to the limit and another, and so on, but each screw in its turn tightened a little at a time until all finally become secure and the shaft turns freely without any detectable end play or binding.

7. Replace seal housing cap as described under "Seal Replacement".

FIELD CHECK LIST

WHAT TO LOOK FOR WHEN

1. No Oil is Delivered.

- a. Suction lift too high for vapor pressures of liquid pumped. While Tuthill Pumps will develop as high as 27 inches of vacuum, it is wise to reduce the vacuum to a minimum.
- b. Bad leaks in suction line or port passages can be detected by submerging pressure line from discharge side of pump into a pail of oil where the air will be seen in the form of bubbles.
- c. Wrong direction of shaft rotation.
In "R" models, check position of cover boss.
- d. Pump shaft not rotating.
Check coupling or drive.
- e. Relief valve setting too low.
Discharging fluid through by-pass port.

2. Capacity is Too Low

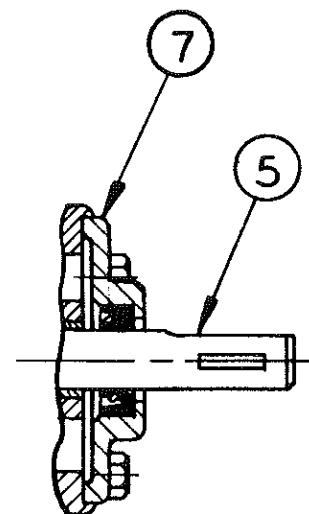
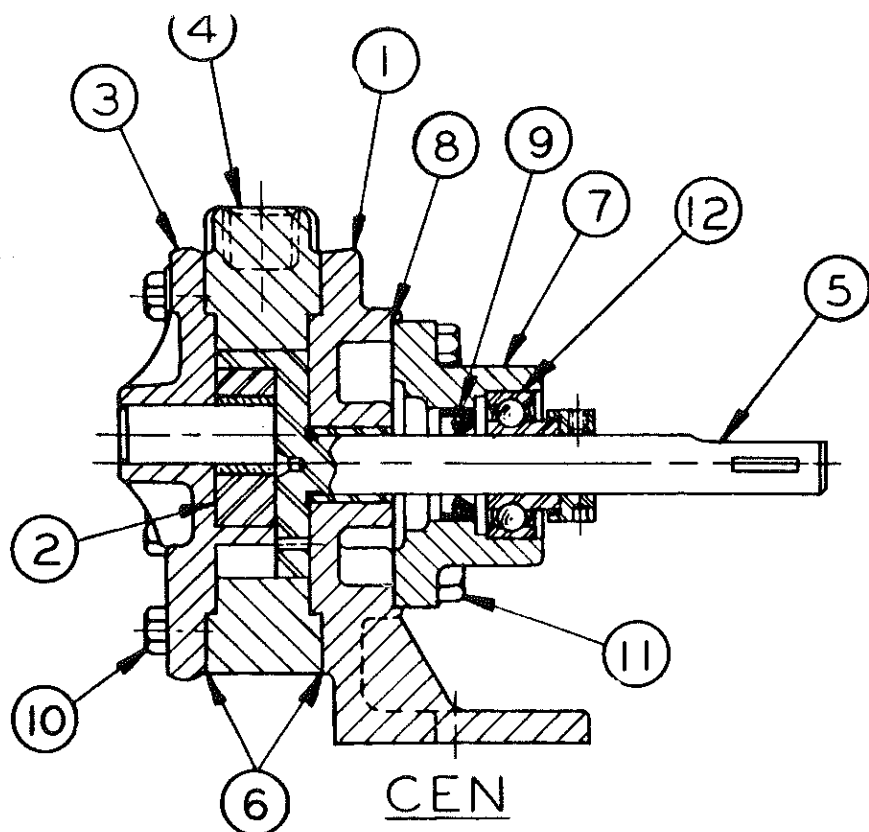
- a. Suction lift too high.
- b. Air leaks in suction line.
- c. Suction line too small.
Can be detected by installing a vacuum gauge directly at the pump suction. The maximum vacuum at the pump suction should never exceed 15 inches of mercury. It is necessary to keep below 15 inches not because of the inability of the pump to handle a higher vacuum, but primarily because of the vaporization that is liable to take place at a higher vacuum. Vaporization caused by higher vacuums will generally result in capacity drop-off.
- d. Pump speed too slow.
- e. Strainer too small or obstructed.

- f. Suction pipe or port not immersed in the liquid deep enough.
 - g. Piping improperly installed, permitting air pocket to form in pump.
 - h. Increased clearances or wear in the pump will sometimes cause the pump to deliver an insufficient supply of liquid.

This can generally be corrected by reducing the thickness of cover gaskets. Great care must be exercised in this operation. A folded gasket or a slight amount of dirt not only will frequently exaggerate the original trouble but will also be the cause of leakage. Refer to assembly pump note for minimum end clearances.
3. Pump Works Spasmodically.
- a. Leaky suction lines.
 - b. Suction lift too high.
 - c. Air or vapor in liquid.
 - d. Coupling slipping on pump shaft.
4. Pump Wastes Power.
- a. Pressure too high.
 - b. Liquid more viscous than desired.
 - c. Suction or discharge lines obstructed.
 - d. Mechanical defects.

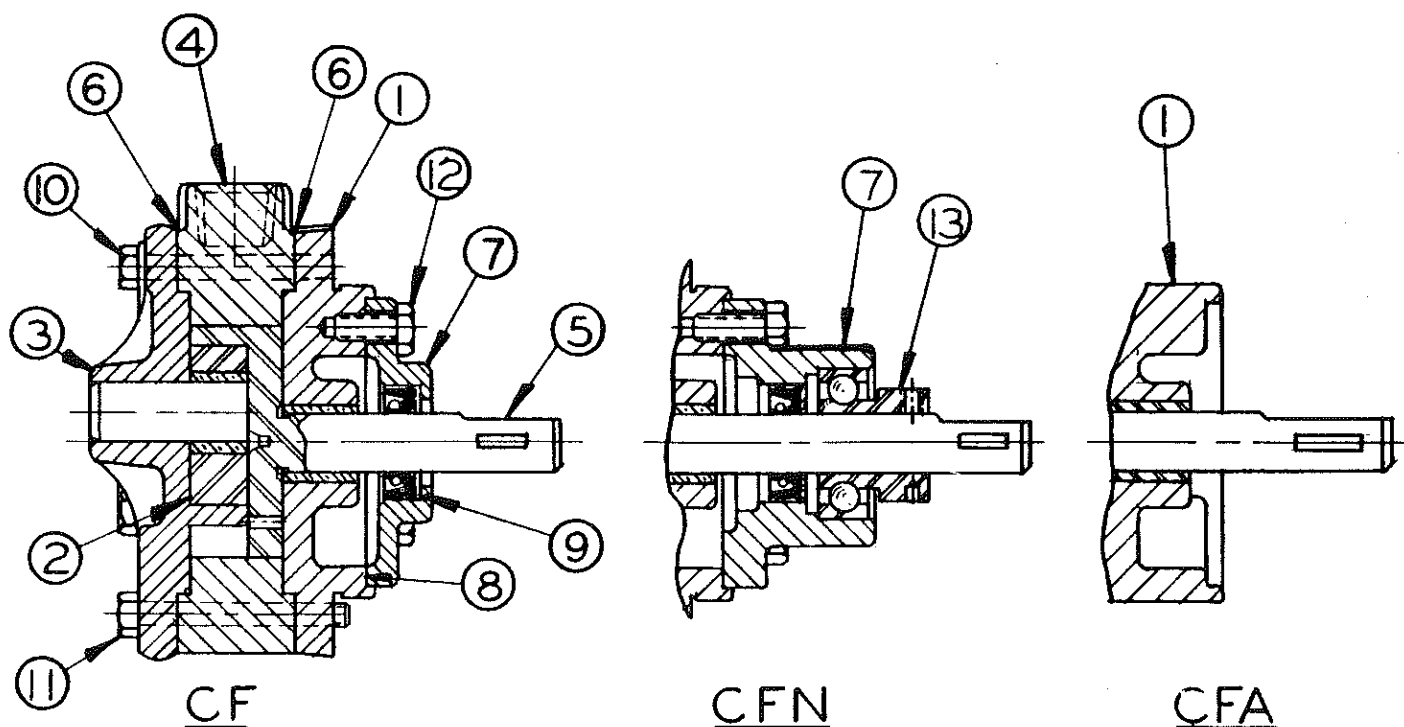
End thrust on pump shaft. (Tuthill pumps are not designed to take end thrust toward the pump cover and care must be taken to prevent thrust in this direction).
Drive shaft and pump shaft misaligned.
The pump may be binding due to insufficient end clearance.
Pump shaft bent.
Misalignment within pump due to bad piping or poor installation, causing strains or distortion.
5. Pump Is Noisy
- a. Machine or part of it is acting as a sounding board.
 - b. Misalignment or bad design of coupling.
 - c. Coupling set too close to pump.
 - d. Vibration of pump because of bent shaft or worn parts.
 - e. Air leaks on suction side of pump.
 - f. Suction lift too high, causing vaporization.
6. Pump Leaks
- a. Cover bolts need tightening, or cover gasket is defective.

Check minimum gasket thickness as described under "Reassembly of Pump."
 - b. Seal is defective or worn.



CE

REPLACEMENT PARTS LIST FOR MODEL CE & CEN PUMPS				
ITEM NO	PART NO	PART NAME (SPECIFY PUMP SIZE & MODEL)	NO PER UNIT	
			MODEL CE	MODEL CEN
1	2	BRACKET ASSEMBLY		
2	5	IDLER ASSEMBLY		
3	6	COVER ASSEMBLY		
4	22	HOUSING		
5	24	ROTOR (CE 24)		
5	24	ROTOR (CEN 24)		
6	34	GASKET	SPECIFY PUMP SIZE	
7	68	HOUSING CAP (CE 68)		
7	68	HOUSING CAP (CEN 68)		
8	74	GASKET		
9	94	SHAFT SEALS		
10	—	COVER BOLTS	SPECIFY PUMP SIZE	
11	—	CAP MOUNTING BOLTS	SPECIFY PUMP SIZE	
12	—	ADAPTER BALL BEARING		

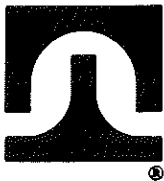


REPLACEMENT PARTS LIST FOR MODEL CF CFA & CFN PUMPS					
ITEM NO.	PART NO.	PART NAME (SPECIFY PUMP SIZE & MODEL)	NO. PER UNIT		
			CF	CFN	CFA
1	2	BRACKET ASSEMBLY CF2	1	1	—
1	2	BRACKET ASSEMBLY CFA2	—	—	1
2	5	IDLER ASSEMBLY	1	1	1
3	6	COVER ASSEMBLY	1	1	1
4	22	HOUSING	1	1	1
5	24	ROTOR	1	1	1
6	34	GASKET	4	4	4
7	68	HOUSING CAP	1	1	—
8	74	GASKET	1	1	—
9	94	SHAFT SEAL	1	1	—
10	—	COVER BOLTS	4	4	4
11	—	PUMP MOUNTING BOLTS	4	4	4
12	—	CAP MOUNTING BOLTS	3	3	—
13	—	ADAPTER BALL BEARING	—	1	—

HANDLE WITH CARE

If it becomes necessary to remove pump from your equipment to return to the manufacturer, plugs should be inserted in the ports to prevent foreign material from getting into it. Tuthill pumps are precision-built and should be given every reasonable care.

These pumps should not be used for handling plain water, corrosive or abrasive liquids, or liquids not possessing adequate lubricity.



TUTHILL PUMP COMPANY

12500 So. Crawford Avenue, Chicago, Illinois 60658

Telephone • Area Code 312 • 389 - 2500